CLAIMS

1. An hybrid protein consisting essentially of the fusion of a membrane protein with an ion channel which is not naturally coupled to said membrane protein.

2. The hybrid protein of claim 1, which comprises a spacer between the membrane protein and the ion channel.

3. The hybrid protein of claim 2, wherein said spacer consists of six glycine or ten glutamine residues.

4. The hybrid protein of claim 1, which comprises a tag, to facilitate the detection and/or the purification of said hybrid protein.

5. The hybrid protein of claim 1, wherein said membrane protein is a receptor.

6. The hybrid protein of claim 5, wherein said receptor is an hormone receptor.

7. The hybrid protein of claim 6, wherein said hormone receptor is the M2 muscarinic receptor.

8. The hybrid protein of claim 6, wherein said hormone receptor is the β2 adrenergic receptor.

9. The hybrid protein of claim 5, wherein said receptor is a receptor for a pollutant/contaminant.

10. The hybrid protein of claim 5, wherein said receptor is an olfactive receptor.

11. The hybrid protein of claim 1, wherein said membrane protein is a transporter.

12. The hybrid protein of claim 11, wherein said transporter is an ABC transporter.

13. The hybrid protein of claim 12, wherein said ABC transporter is from the MRP class.

14. The hybrid protein of claim 13, wherein said ABC transporter is CFTR.

15. The hybrid protein of claim 13, wherein said ABC transporter is MRP1.

16. The hybrid protein of claim 13, wherein said ABC transporter is YCF1.

17. The hybrid protein of claim 13, wherein said ABC transporter is SUR.

18. The hybrid protein of claim 12, wherein said ABC transporter is Mdr1.

19. The hybrid protein of claim 11, wherein said transporter is a transporter for a pollutant/contaminant.

20. The hybrid protein of claim 19, wherein said transporter is an heavy metal transporter.

21. The hybrid protein of claim 1, wherein said ion channel is a potassium channel.

22. The hybrid protein of claim 21, wherein said potassium channel is an ATP-sensitive potassium channel.

23. The hybrid protein of claim 22, wherein said ATP-sensitive potassium channel is from the Kir family.

24. The hybrid protein of claim 23, wherein said ATP-sensitive potassium channel is Kir6.2.

25. The hybrid protein of claim 24, which is SEQ ID NO: 1 to 11.

26. The hybrid protein of claim 1, wherein said ion channel is a voltage dependent channel.

27. The hybrid protein of claim 26, wherein said voltage dependent channel is from the Kv family.

28. The hybrid protein of claim 1, wherein said ion channel is a mechanosensitive channel.

29. The hybrid protein of claim 28, wherein said mechanosensitive channel is MscL.

30. A polynucleotide encoding the hybrid protein of claim 1.

31. A polynucleotide encoding the hybrid protein of claim 25.

32. A primer able to amplify the polynucleotide of claim 25, which is SEQ ID NO: 13 to 16 and 21, 22.

33. A recombinant vector comprising the polynucleotide of claim 30.

34. An host cell expressing the hybrid protein of claim 1.

35. An electrical sensor comprising the hybrid protein of claim 1, incorporated in a membrane.

36. A method for the screening of an agonist of a membrane protein, comprising the step of:

- bringing a drug to test in contact with the electrical sensor of claim 35,

- measuring the resulting electrical signal by appropriate means, and

- selecting the drugs which induce an electrical signal.

37. A method for the screening of an antagonist of a membrane protein, comprising the step of:

- bringing a drug to test in contact with the electrical sensor of claim 35, and with a ligand/substrate of said membrane protein,

- measuring the resulting electrical signal by appropriate means, and

- selecting the drugs which block the electrical signal induced by said ligand/substrate.

38. The method of claim 36, wherein said electrical sensor comprises an hybrid protein according to claim 15, to screen anticancer drugs or multidrug reversing agents.

39. The method of claim 37, wherein said electrical sensor comprises an hybrid protein according to claim 15, to screen anticancer drugs or multidrug reversing agents

40. The method of claim 36, wherein said electrical sensor comprises an hybrid protein according to claim 17, to screen antidiabetic, antiischemic or antihypertensive drugs.

41. The method of claim 37, wherein said electrical sensor comprises an hybrid protein according to claim 17, to screen antidiabetic, antiischemic or antihypertensive drugs.

42. A method for the detection of a contaminant/pollutant, comprising the step of:

- bringing a sample to be tested in contact with the electrical sensor of claim 35,

- measuring the resulting electrical signal by appropriate means, and

- detecting the presence of said contaminant/pollutant in said sample.

43. The method of claim 42, wherein said electrical sensor comprises an hybrid protein according to claim 16, to detect heavy metals such as nickel, cadmium, arsenite and mercury.

44. A method for assaying the activity of membrane protein, comprising the step of:

- bringing a ligand/substrate of said membrane protein in contact with the electrical sensor of claim 35, and

- measuring the resulting electrical signal by appropriate means.

45. A kit for the screening of an agonist/antagonist of a membrane protein comprising at least the electrical sensor of claim 35.

46. A kit for the detection of a contaminant/pollutant comprising at least the electrical sensor of claim 35.